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Lecture 9

FNT 628

Blockchain and Cryptocurrencies

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Cryptocurrency Investment

Introduction

- Cryptocurrency is a digital asset designed to work as a store of value and a medium of exchange.
- As of February 28th, 2018, the total market capitalization of the cryptocurrency market stood at \$448 billion and consists of 1,524 types of currencies.
- Amongst the many controversies surrounding cryptocurrencies, a popular topic of debate is whether it should be classified as a commodity, investment, property, currency or digital currency.
- Bitcoin puts cryptocurrencies center stage in the popular press and with the recent painful pull back in early 2018, the interest in Bitcoins in particular continues to hold.

Introduction

- Bitcoin, the first successful cryptocurrency, was created in January 2009, in the aftermath of the financial crisis of 2008, by an unknown person or a group of people under the Japanese name of Satoshi Nakamoto.
- Bitcoin utilizes a technology called blockchain, which is a combination of cryptography, consensus algorithms, economic incentives and distributed ledger to secure its transactions.
- While the technical discussion of blockchain is beyond the scope of this work, this technology has endowed Bitcoin with many important characteristics, such as;
 - Decentralization,
 - Trusted network built upon potentially untrustworthy nodes,
 - Transparency, and
 - Immutability history, etc.

Introduction

- Many cryptocurrencies were invented after Bitcoin, but Bitcoin continues to be the most popular, as evidenced by it having the largest market capitalization and trading volume, shown in Table 1 below.
- Subsequently, our investigation primarily focuses on Bitcoin prices in this research.

Index	Name	Price	Market Cap (\$Billion)	Volume (24 hrs \$Billion)
1	Bitcoin	\$10,559.20	\$178.4	\$6.9
2	Ethereum	\$869.63	\$85.1	\$2.0
3	Ripple	\$0.921	\$36.0	\$0.33
4	Bitcoin Cash	\$1,223.85	\$20.8	\$0.38
5	Litecoin	\$208.43	\$11.6	\$0.78
6	NEO	\$135.27	\$8.8	\$0.33
7	Cardanol	\$0.317	\$8.7	\$0.12
8	Stellar	\$0.346	\$8.2	\$0.037
9	EOS	\$8.64	\$6.0	\$0.38
10	IOTA	\$1.89	\$5.3	\$0.044

Table 1: Top Ten Cryptocurrencies

(Source: CoinMarketCap.com, data as of February 28th, 2018.)

Bitcoin

Bitcoin

- Broadly speaking, Bitcoin can be categorized as a “digital currency.”
- In many ways, Bitcoin works like any other form of money, with the exception that there is no physical money and transactions occur entirely through the Internet.
- There are other kinds of digital currencies out there, but Bitcoin is the most well known, widely used, and valuable at this time.
- As we begin to dive in, it will be helpful to think about Bitcoin in two ways: **both as a currency and as a technology.**

Bitcoin as a currency

- When we begin to think about Bitcoin as a currency, or a digital asset, there are two big questions that most people ask right away:
 - How is the value of Bitcoin determined?
 - How is it actually used?

How is the Value of Bitcoin Determined?

- To answer the first question, it is helpful to think about paper money, like US dollars.
- When push comes to shove, there is really not much physical difference between a one hundred dollar bill and a piece of paper.
- The reason a one hundred dollar bill is understood as something more than a piece of paper is because of a consensus amongst citizens to accept that particular piece of paper as having a designated value that can be traded for goods and services.
- There are a lot of factors behind the scenes that bring a society to this agreement, but in a nutshell: any currency has value because enough people agree that it does is.

How is the Value of Bitcoin Determined?

- The same principle holds true for Bitcoin.
- Bitcoin's value is contingent on the number of people who are willing to accept it as payment, a group that is growing in size almost daily.
- Obviously, if nobody was willing to accept Bitcoin as a form of currency, it would be an undesirable thing to possess, nobody would want it, and it would be worth nothing.
- We can see by looking at the price of Bitcoin, however, that people do use it and it does have value.
- The price of Bitcoin at any given time is, like other commodities, determined by the relationship between supply and demand.
- As the level of demand goes up, the price of Bitcoin also increases, and vice-versa.

How is Bitcoin Used?

- Bitcoin can be used much like any traditional currency, such as US Dollars or Euros. You can use Bitcoin to send and receive payments, make purchases, or even put BTC into a “savings account” for the future.
- Bitcoin can also be treated like an investment, similar to how one might invest in a stock.
- Have you ever used a credit card to make a purchase online, or transferred money electronically from one account to another? When it comes to using Bitcoin for transactions, the process feels very similar in practice.
- We can make purchases by transferring a certain amount of Bitcoin directly from one account to another, from the buyer to the seller.
- You can currently buy a lot of things with Bitcoin, but not everything.
- In order to make a purchase with Bitcoin, you will have to find a vendor who is willing to accept it as a form of payment.
- Many big name companies already offer Bitcoin options, including Subway, Microsoft, OkCupid, Whole Foods, Etsy, and Overstock.com.
- New vendors from a wide range of industries are adding options for Bitcoin payment all of the time.
- As more people begin to participate in the Bitcoin economy all over the world, vendors are responding to the increasing demand from customers to accept Bitcoin.

How is Bitcoin Different?

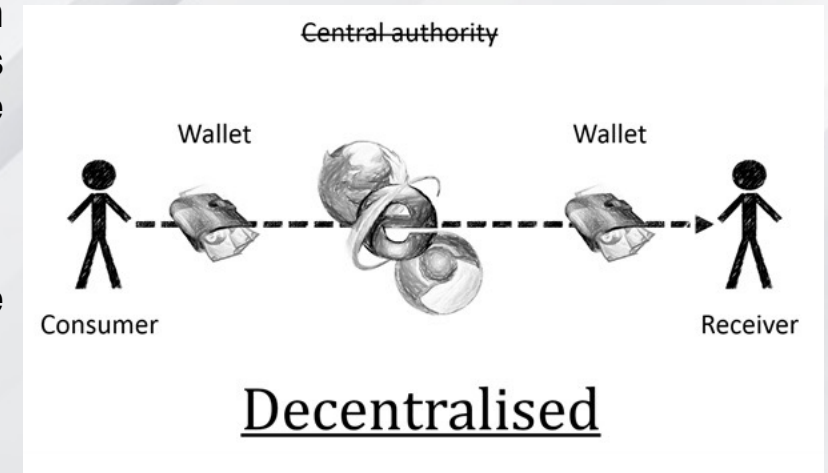
- One of the major barriers to entry in terms of Bitcoin is that a lot of people struggle with the idea of a currency that is not physical.
- When we think of traditional currencies (called “fiat”) like the US Dollar or the Euro, we often think of paper money.
- Many of us are used to thinking about money as cash- as a tangible thing that we carry around.
- In reality, however, most people don’t carry around sacks of cash.
- The bulk of our money is stored in banks.
- Why is this? Paper money has been standard for some time, but it is ultimately not very practical.
- It can be lost, stolen, or damaged easily.
- On top of that, there is nothing that ties a particular piece of paper money to any one person .

How is Bitcoin Different?

- If you have your entire life savings stuffed under your mattress and you get robbed, there is nothing in the money itself that will point back to you as the owner.
- Unless the police happen to bust the robber, there is a good chance the money is just lost forever.
- It is largely because of this vulnerability that we rely on banks to store the bulk of our money for us. Banks guarantee a level of security in exchange for fees and a certain degree of control over the money we keep in our bank accounts.
- Historically, banks have existed as essentially the only option for people to keep currency in a secure, centralized location, backed up with a guarantee. But, are banks really the best solution to the problem of storing our money?
- Depending on a variety of factors banks can regulate, limit, and control the access we have to our own money.
- For example, we may not be allowed to withdraw more than a certain amount at a given time. We might be charged high transaction fees to move money between our different accounts.
- If a bank is hacked, millions of accounts can be affected because everything is stored on in one centralized database.
- Ultimately, most of us end up storing our money in banks despite the various pitfalls because there is no better alternative.
- We have no choice but to trust these institutions or risk stuffing cash under the mattress.

How is Bitcoin Different?

- Bitcoin offers an alternative. Unlike traditional currencies, Bitcoin is decentralized.
- Transactions happen on a peer-to-peer basis without the need for a “middleman,” like a bank, government agency, or other third-party institution.
- For this reason, Bitcoin and many other cryptocurrencies are often referred to as “trustless,” meaning that we can make transactions without needing to put our trust into either the person we are transacting with or a financial institution.
- If you’re new to Bitcoin, you might be wondering how this works.
- In order to shed some light on the inner workings of this space, we need to switch gears for a minute and look at Bitcoin as a technology.



Investing in Bitcoin

- Particularly as Bitcoin has become more popular, there is a lot of advice floating around on how to make money with Bitcoin and other cryptocurrencies.
- In reality, there is no secret, easy foolproof method to invest \$100 and come out with \$10,000.
- As with any market, Bitcoin trading is a system of risk and reward and there are no guarantees.
- Just because Bitcoin is a digital currency does not mean you can't lose "real money." Of course, you can make real money, too, but it is important to remember that this is a high-risk space.

Investing in Bitcoin

- Compared to traditional markets, the cryptocurrency space is extremely volatile.
- Prices can fluctuate significantly over one day, or even one hour.
- It is not uncommon to see values swing up or down by 20% or more in 24 hours.
- Particularly for traders coming from traditional markets, the peaks and crashes in the cryptocurrency space can certainly get your adrenalin pumping.
- Many people have made the mistake of hearing about Bitcoin (or another cryptocurrency) for the first time, usually as a result of some hype, and immediately buying in while the price is at a high, thinking they will get in before it goes up even more.
- Then they see the price of the currency plummet.
- In a panic, they sell it all off to cut their losses before it sinks any more, only to see it level out or soar again a few days (or hours) later.
- There is no way to guarantee that this will not happen even to savvy traders, but you can do a lot to improve your odds of success.

Investing in Bitcoin

- The single most important thing you can do as an investor in the cryptocurrency world is to do your own research. Arm yourself with good resources and take the time to study the trends.
- Particularly as Bitcoin has entered the mainstream, there has been a huge rise in self-proclaimed Bitcoin gurus, some of whom are more credible than others.
- Explore freely, but keep in mind that anything promising “instant wealth” is worthy of healthy skepticism.
- A great way to get familiar with the landscape of Bitcoin exchanges is to spend some time looking at the charts. Study the peaks and dips, level of stability, and researching any anomalies.
- Did something happen at a certain point to trigger a huge jump or drop? Was there a significant global event, did an article come out in a popular magazine, did an industry leader begin accepting Bitcoin? Could a similar thing happen again? These are good questions to consider.
- Almost all Bitcoin exchanges have charts that graph the historical trends and offer real-time updates on value, volume, and other statistics.
- [Coinmarketcap.com](https://coinmarketcap.com) is one popular website that offers daily overviews, history, and information on a wide variety of cryptocurrencies.

Investing in Bitcoin

- The more information you have, the better equipped you will be to see new opportunities and avoid common mistakes.
- Get to know the Bitcoin space, read articles, engage with the community, and explore the tools and resources available.
- Nobody can predict the future, but the more aware you are of trends on a moment-to-moment basis, the more likely you are to anticipate the behavior of the markets correctly. What you ultimately choose to do with your money is your business, but one famous adage that you may want to keep in mind is:

“Don’t invest more than you can afford to lose.”

Bitcoin Exchanges & Trading

- When it comes to “trading with Bitcoin,” there are several ways that this can happen.
- The most basic way to do it is to buy Bitcoin with fiat (US dollars, Euros, etc.), wait for the price of Bitcoin to go up, and then exchange it back into fiat.
- Of course, there is no guarantee that the price will go up; it could just as easily go down. Being familiar with the trends, history, and current affairs can help you make informed decisions about when to buy in and cash out.
- Some firm believers in Bitcoin might argue that this approach of trading between Bitcoin and fiat “misses the point.”
- On an ideological level, there are valid reasons for that sentiment.
- Realistically, however, many people see Bitcoin as an investment and not a “replacement” for fiat currency.
- Whatever your opinion on the matter, the fact remains that people have increased their wealth by using this approach.

Bitcoin Exchanges & Trading

- You can find a list of online exchanges that deal with trading between Bitcoin and national fiat currencies at <https://bitcoin.org> .
- To do this type of trading successfully, you will also want to be very conscious of transaction fees, delay times, and exchange reputability.
- These factors can all differ between exchange platforms and can change in response to any number of events or circumstances.
- All exchanges come with their own unique pros and cons.
- Accessibility to certain exchanges may depend on your nation of residence.
- Some of the most popular exchanges in the US are Poloniex, Bittrex, GDAX, Coinbase, and Kraken.
- Once again, all of these have different features and may be more suited to a particular set of needs.
- Coinbase is widely considered to be one of the easiest platforms for beginners, as it allows you to buy Bitcoin with a large variety of national fiat currencies through a very userfriendly interface.

Bitcoin Exchanges & Trading

- Bitcoin exchanges, in general, have an initial learning curve for many people, particularly those who are new to markets and trading.
- Even those coming from a background in the stock market may find that Bitcoin exchanges take some getting used to.
- All exchanges tend to have different rules, spending limits, levels of verification, security practices, and tools available.
- Plus, not all exchanges deal in all cryptocurrencies. Generally, however, all exchanges do trade primarily in Bitcoin.

“The Fast Nickel or The Slow Dime”

- There is an expression that you may have heard before in relation to investing: the fast nickel or the slow dime.
- Essentially, this means making a little bit of profit in the short term or a larger profit over the long term.
- When it comes to trading Bitcoin, there are plenty of people who employ both of these strategies.
- Some investors choose to buy Bitcoin once, ideally when the value is low, and hold on to it, believing that the price will trend upwards over time and eventually pay off big-time.
- Obviously, this worked out very well for early adopters who held on to their initial Bitcoin investments.
- Some speculate that Bitcoin will undergo another massive price increase in the future.
- These folks will continue to hold tight to their Bitcoin throughout price fluctuations, hedging their bets on long-term growth. This would be the “slow dime” approach.
- (Buying into a cryptocurrency and holding on to it is often called/spelled “hodling” in online cryptocurrency communities).

“The Fast Nickel or The Slow Dime”

- There are others who watch the space diligently and regularly shift funds back and forth between Bitcoin, fiat, and other cryptocurrencies, taking advantage of minor price fluctuations, somewhat similar to Wall Street-style day trading.
- These speculators aim to buy when prices are low and sell when they go up to make a quick profit (the “fast nickel”).
- Often the gains are smaller using this approach, but enough successful trades can add up quickly.
- While trading between fiat and Bitcoin is one way that people can make (or lose) money, trades in the cryptocurrency space often involve exchanging one cryptocurrency for another, rather than trading with fiat.
- Bitcoin is, in this context, sort of like the “gateway” cryptocurrency.

Trading Between Cryptocurrencies

- There are hundreds of cryptocurrencies out there besides Bitcoin, with varying levels of value, volume, and potential.
- An active trading culture exists surrounding a number of these alternative currencies (often called “alt-coins”). Some examples of popular alt-coins include Ethereum, Litecoin, and Dogecoin.
- In order to buy into most alt-coins, one usually needs to have Bitcoin to begin with.
- Most alt-coins cannot be purchased directly with fiat, but rather with Bitcoin, although there are some exceptions.

Trading Between Cryptocurrencies

- The alt-coin space is a bit of a “wild west,” where high risks can lead to high rewards or big losses. Remember the early Bitcoin adopter who bought 2 pizzas?
- For many, the appeal of investing in alt-coins is that they have the potential to increase dramatically in value, like Bitcoin did.
- If an alt-coin is backed by a promising application and strong development team speculators may invest if they see potential for growth.
- Hedge funds have even begun to emerge dealing exclusively in cryptocurrencies and blockchain technology.

Trading Between Cryptocurrencies

- The emerging paradigm of blockchain-based currencies and applications has led to a huge surge of speculative investment in this space, which in turn has led to an abundance of new “alt-coins” competing to lead the way in different specialized use cases.
- Ethereum, for example, is widely seen as second to Bitcoin as the most popular cryptocurrency.
- There are some who believe that Ethereum will surpass Bitcoin in both value and popularity, and have hedged their “slow dime” bets by investing in Ethereum.
- Likewise, there are many who have invested in other promising newcomers to the space and are willing to wait five years or more for the value to increase.

Trading Between Cryptocurrencies

- For serious investors interested in emerging technologies, the cryptocurrency and blockchain space beyond Bitcoin is extremely promising.
- Like many up-and-coming tech spaces, there is also a lot of noise to sift through.
- Everybody has an opinion on the future of blockchain technology, and obviously they can't all be correct.
- Listening to others is a great way to learn, but it is up to you to form your own opinions and decide what's in your best interest.

Getting Paid in Bitcoin

- Bitcoin's value and long-term viability is largely dependent on how many people are willing to accept it as a form of payment. With the recent rise in mainstream recognition, more and more vendors are offering the option pay for goods and services with Bitcoin.
- Historically, the volatility of Bitcoin has made many businesses reluctant to adopt it as a payment option.
- Today, however, more and more companies are integrating options for Bitcoin payment into their business model.
- You can now pay for things like plane tickets, online classes, cheeseburgers, and much more with a Bitcoin transaction.
- For freelancers, small businesses and entrepreneurs, getting paid in Bitcoin is one way to invest in the currency.
- If you get paid in Bitcoin for a service and the value of Bitcoin goes up more than the value of whatever fiat currency you would have otherwise been paid in, you can continue to earn even after the job is over.
- Of course, it bears repeating that the opposite could happen, as well.
- Many people set up wallets to accept tips in Bitcoin, which can be a fun way to get your feet wet without staking too much.

Bitcoin Faucets

- If you spend some time online searching Bitcoin topics, you will likely come across a mention of Bitcoin “faucets.”
- These are websites that you can visit to receive very small amounts of Bitcoin for free every so often.
- Most faucets operate by giving away a “trickle” of free Bitcoin, while actually making money by showing ads on the webpage.
- Some faucets feature games, such as digital dice, which yield higher or lower rewards from the faucet.
- Generally speaking, you will not make very much money from faucets, although if you make a point of visiting every day over a long period of time it can add up.



Ethereum

Ethereum

- The cryptocurrency space is notoriously volatile.
- Things change on a daily basis and new coins are being developed all the time. What is considered revolutionary one day can be obsolete the next.
- That being said there are some digital currencies that have achieved relative stability. Bitcoin is widely considered to be the leader in blockchain-based currencies, but Ethereum has gained a lot of traction since its inception in late 2013.
- Ethereum was developed by the programmer Vitalik Buterin.
- Unlike Bitcoin, which functions solely as a digital currency, Ethereum is a blockchain based platform for developing decentralized applications that run using “smart contracts.”
- Where Bitcoin serves an electronic peer-to-peer cash system, the Ethereum blockchain runs the code making up decentralized applications.

Ethereum

- It may be helpful to visualize Ethereum as similar to a smartphone.
- A smartphone comes with a general operating system, like iOS or Android.
- Anybody can create apps that do any number of different things to run on that operating system.
- Ethereum, in this analogy, is like the operating system: a framework to build upon.
- One application that runs on Ethereum is a digital currency, which is often also referred to as “Ethereum,” although technically it is called Ether.
- This can be confusing since both the currency and the platform are usually called “Ethereum,” but it is important to remember that the currency is merely one aspect of the Ethereum blockchain framework. As a reward for maintaining the Ethereum blockchain, Ethereum “miners” are rewarded with Ether.

Ethereum

- From its inception, Ethereum mining has worked on a Proof-of-Work consensus model similar to Bitcoin.
- As of 2017, however, the team behind Ethereum has announced plans to shift to a Proof-of-Stake model.
- Understanding the difference between these two systems of validating blockchain transactions is crucial to gaining context for some of the most pressing debates in the larger blockchain space today.
- When we looked at “Proof of Work” as integral to the Bitcoin protocol, we covered how Bitcoin miners have to invest in special mining equipment that requires a lot of electricity to run in order to solve a block.
- Proof of-Stake (PoS) works a bit differently. A Proof-of-Stake model is a bit more like gambling. Rather than being called “miners,” Ethereum is moving towards the term “validators.”
- Validators stake a certain amount of their own money (Ether, in the case of Ethereum) towards solving a block. The more money a validator stakes, the higher the probability that they will solve the block.

Ethereum

- The year 2017 has seen a marked increase in general awareness and interest in digital currencies, such as Bitcoin, as well as the underlying technology driving this new economy, known as “blockchain.”
- Major industries ranging from healthcare to finance, governmental agencies, and a wide variety of startups are beginning to explore the potential for blockchain technology to radically reshape the landscape of institutional structures.
- There are generally two things that draw most people to the space of blockchain tech and cryptocurrencies. The first is money.
- Many people have heard the story of Bitcoin’s rapid rise from having almost no value to being worth thousands of dollars over the course of a few short years.
- Naturally, everybody who hears about this today wishes that they had known about Bitcoin sooner and had invested in the early days.
- Of course, it makes sense that this would provoke anyone to look further into the cryptocurrency space in hopes of finding “another Bitcoin.” This is how many people first become acquainted with Ethereum.

Ethereum

- The second reason that people generally tend to be drawn to the cryptocurrency space is an interest in the technology.
- There is a great deal of potential for blockchain-based applications to reshape various industries, institutions, and social structures.
- Of course, these two broad interests, money and new technology, are not mutually exclusive. After all, who doesn't want to change the world and get rich at the same time?
- Regardless of where your initial interest in Ethereum comes from, it is important to understand Ethereum as both a currency and a technology.
- As we begin to explore Ethereum, it is important to note that many people refer to the Ethereum currency as "Ethereum."
- Technically, the currency unit is known as "Ether."
- Ether is one component of the much larger framework of "Ethereum."
- For the sake of clarity, we will use the term "Ether" in reference to the currency from now on, although in the real world you may see it called both Ether and/or Ethereum.

Ethereum

- Whether you plan to simply invest in Ether as a currency or you want to build a revolutionary application on the Ethereum platform, it is critical to understand the role of both the currency and the larger framework.
- In the cryptocurrency space, as of today, Ether is second only to Bitcoin in terms of popularity and value.
- In a few short years, it has gained considerable traction and become a forerunner in the burgeoning blockchain revolution.

Ethereum

- The initial concept for Ethereum was introduced in the year 2013, detailed in a white paper written by Russian-Canadian programmer Vitalik Buterin.
- Buterin, only 19 years old at the time, had already been involved with Bitcoin for several years. In 2014, he received the Theil Fellowship and was awarded \$100,000, which prompted him to go drop out of college and dedicate himself full-time to developing Ethereum.
- As an active participant in the cryptocurrency space, Buterin saw the potential for extending the blockchain structure beyond Bitcoin.
- The initial vision for the Ethereum project was to create a platform to develop decentralized applications with broad capabilities. Simply put, Buterin envisioned possibilities for a Bitcoin-like system that could be used for more than just one kind of peer to- peer financial transactions.
- Buterin's ultimate vision for Ethereum can be viewed as an earnest attempt to apply learnings from Bitcoin's decentralized, global cryptographic network to challenges beyond mere value exchange. Rather than just cutting out the middleman and simply sending and receiving money, the programmers saw the bigger picture and saw the possibility of using "bitcoins" to represent commodities, derivatives or even deeds to real estate – Pretty much anything for which a secure, fixed unit of code could function as a digital asset.

Ethereum

- In essence, Buterin envisioned how the platform could remove the conventional arbitrators of trust and in turn enable a new wave of application development – one that could possibly change the way we carry out “trusted” transactions without the use of outdated, painstaking slow legal systems that are in place today.
- By 2014, Ethereum had established a core team of developers, gained considerable support, and was officially under development.
- A crowd-sale of the initial round of Ether, the digital currency used by Ethereum, took place in July- August of 2014, with proceeds funding further development of the software.
- On July 30, 2015, the first iteration of Ethereum officially went live.
- Today, Ethereum is still maintained by a central team of developers, including founder Vitalik Buterin, and is managed by a Swiss non-profit organization called the Ethereum Foundation.
- Unlike Bitcoin, whose creator remains a mystery, Buterin serves as a figurehead for this project and his identity is very much tied to Ethereum.
- While there are many other programmers and thinkers contributing to the development of Ethereum, Buterin is generally viewed as the inventor and the “face” of the project.
- Some critics have expressed concern over the centrality of the Ethereum project and a “cult of personality” surrounding Buterin.

Ethereum

- Throughout its short history, Ethereum has provoked international interest, gained a lot of support, and received its fair share of criticism, as well.
- Ether, as a currency, despite periods of volatility, has become one of the more valuable digital currencies in the cryptocurrency space.
- Particularly because it is such a new technology, it is impossible to predict what the future holds for the Ethereum platform.
- Throughout 2016 and 2017, we have seen a huge uptick in global interest in cryptocurrencies and the concept of blockchain technology across many industries and institutions.
- The Ethereum platform represents, for many, the closest thing that currently exists to a framework for building decentralized blockchain applications capable of running autonomously.
- At the same time, Ethereum is still in its early stages.
- Many argue that it has not yet reached the level of stability, security and scalability necessary to usher in the future of blockchain and decentralized applications.

Predicting Bitcoin Prices

- While there are many cases and projects about Bitcoin price predictions online, scarce academic research presently exists regarding Bitcoin price predictability. We review the most important prior research in this subject by aggregating them into three different groups.
- The first group attempts to predict Bitcoin prices with information about the Bitcoin blockchain network.
- For example, Madan et al. [1] from Stanford use three machine learning algorithms to predict the sign of daily price change of
- Bitcoin based on data about the Bitcoin blockchain network, including average confirmation time, block size, hash rate, etc.
- They report a highest accuracy of 98.7%. Another group of Stanford researcher, Greaves et al. [2] perform similar analysis, getting a classification (sign of hourly price change) accuracy of 55%.
- In addition to information about the blockchain network, McNally [3] adds daily open, high, low, and close prices as explanatory variables, reporting a classification (signs of daily price changes) accuracy of 52%.
- El-Abdelouarti Alouaret [4] moves further by including the S&P 500 index and EUR/USD rate, as well as a variable named bitcoins days destroyed.
- Similar to sentiment analysis, it also includes a variable representing daily page view on the Wikipedia item “Bitcoin”.
- It also uses vector autoregression and recurrent neural network to conduct price prediction instead of classification.

Predicting Bitcoin Prices

- The second group of studies focus on the relationship between social media data and Bitcoin performance.
- For instance, Mai et al. [5] analyze Bitcoin-related user posts from a forum and Twitter and demonstrate that more bullish posts are associated with higher future Bitcoin returns.
- They also conclude that the social media effects on Bitcoin performance are driven by the “silent majority”, and the impact of forum posts is larger than that of tweets.
- Stenqvist et al. [6] try to predict Bitcoin price (up/down) using sentiment analysis on Twitter, and report that the sentiment change over a 30-minute period is useful for predicting price movement of 2 hours later, resulting in an accuracy of 79%.
- Instead of performing sentiment analysis on all social media content posted, Kim et al. [7] extract the hottest topics on a Bitcoin-related forum and define a time series score to represent the “strength” of each topic.
- While these scores are not significant in Granger causality tests, a deep learning model with these scores as inputs leads to prediction (for price and transaction volume) accuracies ranging from 50%+ to 80%+.
- Interestingly, Kaminski [8], by analyzing Twitter posts, claims that social media sentiments mirror the Bitcoin market activity, rather than being predictive.

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